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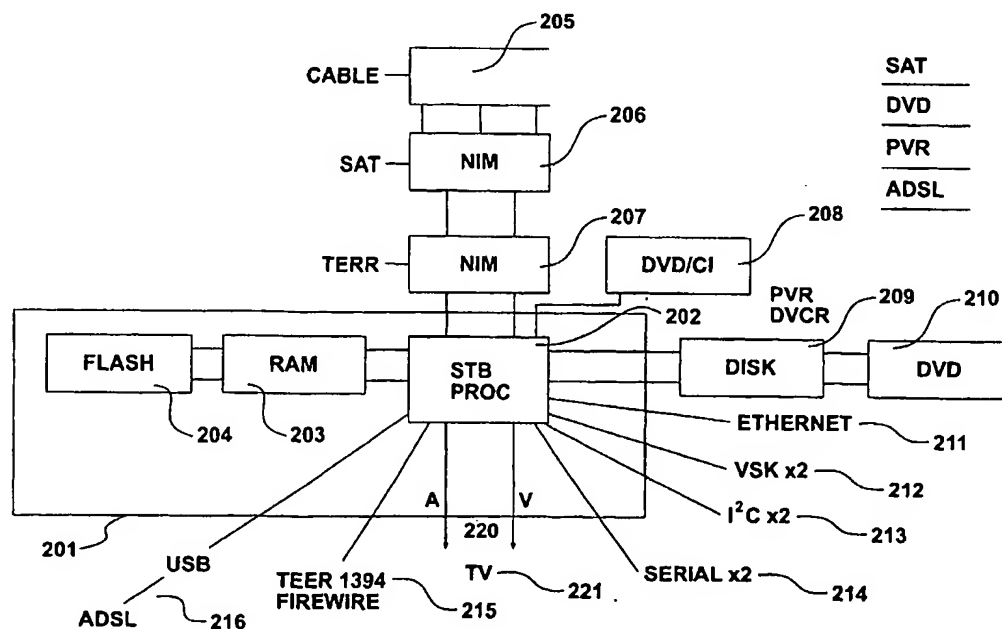
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(54) Title: MODULAR SET TOP BOX ASSEMBLY



(57) Abstract: A digital data transceiver is provided, such as a set top box, having a central processor (201) and at least one module (206) which may be removably connected to the processor (201). A plurality of modules (205, 206, 207, 208, 209, 210, 211, 212) may be connected to each other and still communicate with the central processor (201). This allows a consumer to purchase a set top box having minimal functionality required to meet the user's basic requirements. Additional modules can be added to the basic box (301, 302 and 303) to provide further functionality as a user requires. A system of authenticating modules is also provided for configuring modules or updating modules software required.

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*Modular Set Top Box Assembly***TECHNICAL FIELD OF THE INVENTION**

This invention relates to transceivers of digital information. The invention is specifically directed to, but is not limited to, apparatus and methods for transmission and reception of digital  
5 information, data and the like through transceiver devices such as set top boxes (STB's).

**BACKGROUND OF THE INVENTION**

Set top boxes are devices which enable receipt and transmission of signals provided by a remote provider of data for use by a consumer. Typically, the transmitted data will include information  
10 relating to audio visual signals which a set top box may provide in appropriate form for a viewers television set to display desired visual images and audio information such as a broadcast television programme.

Known STB are each dedicated to the provision of services from a remote transmission service. Therefore, for example, many existing direct broadcast digital satellite providers or digital cable  
15 providers provide a set top box which only works with broadcasts from that particular provider. In the example of digital broadcasting, this provides a number of advantages including a wide variety of programmes or channels and high quality audio and visual information. The STB that is used is typically provided in the subscriber's home and is provided in close physical proximity to a television set or other consumer electronic equipment.

20 Presently, the market is divided into service segments with manufacturers providing individual solutions for receiving information from the information provider. For example, the satellite pay TV market traditionally employs a dedicated box providing basis services of satellite received channel selection and subscriber entitlement. Basic programme select functionality is

usually provided via a remote control. At present there is no equipment available to integrate a plurality of features into the existing set top hardware unless a plurality of set top boxes is provided, each for a dedicated purpose.

5 With communications technology developing at a rapid rate, consumer demand for online or satellite audio and visual services is also increasing. However, customer requirements are also changing very quickly, so it is very difficult to determine a configuration for an ideal set top box. One particular problem is that to provide flexibility of a set top box which is capable of being used to receive information from a variety of information providers, the box needs to include a large number of features. However, customers do not want to pay for features that  
10 may not be required, and manufacturers are not prepared to give away features for free.

## OBJECT OF THE INVENTION

It is an object of the present invention to provide a transceiver of digital information, or method for transmission and reception of digital information which will at least provide an improvement  
15 over the prior art, or which will at least provide the public with a useful choice.

## SUMMARY OF THE INVENTION

Accordingly in one aspect the invention consists in a set top box assembly having

- an input for receiving input signals from one or more remote service providers,
- 20 a central processor for controlling distribution to a consumer of signals received from the remote service provider.
- an output for distributing audiovisual signals processed by the central processor
- the set top box characterised in that it includes at least one module which is adapted to recognise at least one signal received by the central processor or transfer a further signal

to an adjacent module, such that the consumer may receive a visual or audio signal according to the recognition of that signal by a particular module.

In a further aspect the invention may broadly be said to consist in an assembly enabling the provision through subscriber networks of a variety of audiovisual signals from remote locations  
5 to a consumer station such that the consumer has a choice of the audiovisual services from one or more remote service providers, wherein the assembly comprises

a set top box having an input for receiving signals from remote locations,

a central processor for control of distribution to the consumer of the signals received from the remote service provider,

10 an output from the set top box for distributing audiovisual signals processed by the central processor,

an interface connecting at least one other discreet module to the central processor wherein in each module is capable of receiving and distributing at least one signal delivered to or from the central processor, and

15 wherein the interface allows access to the central processor for processing signals from the module and each module is capable of recognising a signal intended for that module and distributing through the module signals recognisable by another module and intended for at least one of the other modules.

In still another aspect the invention may broadly be said to consist in an assembly enabling the  
20 provision through subscriber networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer has a choice of the audiovisual services from one or more remote service providers, wherein the assembly comprises

a set top box having an input for receiving signals from remote locations.

25 a central processor for control of distribution to the consumer of the signals received from the remote service provider,

an output from the set top box for distributing audiovisual signals processed by the central processor.

an interface connecting at least one other discreet module to the central processor wherein in each module is capable of receiving and distributing at least one signal delivered to or from the central processor, and

wherein the interface allows access to the central processor for processing signals from the module and each module is capable of recognising a signal intended for that module and distributing through the module signals recognisable by another module and intended for at least one of the other modules.

10 In still another aspect the invention may broadly be said to consist in an assembly enabling the provision through subscriber networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer has a choice of the audiovisual services from one or more remote service providers, wherein the assembly comprises

a set top box having an input for receiving signals from remote locations,

15 a central processor for control of distribution to the consumer of the signals received from the remote service provider,

an output from the set top box for distributing audiovisual signals processed by the central processor,

20 an interface connecting at least one other discreet module to the central processor wherein in each module is capable of receiving and distributing at least one signal delivered to or from the central processor, and

wherein the interface allows access to the central processor for processing signals from the module and each module is capable of recognising a signal intended for that module and distributing through the module signals recognisable by another module and intended for at least one of the other modules.

In still another aspect the invention may broadly be said to consist in a set top box having an input for receiving input signals from one or more remote service providers, a central processor for controlling distribution to a consumer of signals received from the remote service providers,

an output on the set top box for distributing audiovisual signals processed by the central processor,

the set top box including at least one module which is adapted to receive or transmit signals containing audio and/or visual information to or from the central processor,

the set top box including authentication means whereby valid authentication provides a first degree of connectivity between the central processor and the module. and

invalid authentication provides a second degree of connectivity between the central processor and the module.

In still another aspect the invention may broadly be said to consist in a system enabling the provision through one or more subscriber networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer has a choice of the audiovisual

services from one or more remote service providers, the system including

a set top box having input for receiving input signals from the one or more remote service providers,

a central processor for controlling distribution to the consumer of the signals received from the one or more remote service providers.

the set top box having an output for distributing audio visual signals processed by a central processor,

the set top box including at least one module which is adapted to receive signals from or transmit signals to the central processor.

the system including software management means whereby information required for operability of the module or the central processor is provided to the module or the central processor while the system is operating.

In yet another aspect the invention may broadly be said to consist in a method for enabling the provision through subscribing networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer has a choice of audiovisual services from one or more remote service providers, the method comprising the steps of

- 5 (a) providing a set top box having an input for receiving signals from the one or more remote locations, a central processor for the control and distribution of signals received from the remote service providers to the consumer,
- (b) providing on the set top box an output for distributing audiovisual signals processed by the controller,
- 10 providing an interface connecting at least one other discreet module to the central processor, each module being capable of receiving or distributing at least one signal delivered from the controller.

In yet a further aspect the invention may broadly be said to consist in a modular transceiver assembly, each module having connection means thereon to allow modules to be  
15 connected adjacent to each other and to provide electronic communication between modules.

To those skilled in the art to which the invention relates, many changes in constructions and widely different embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosure and descriptions herein are purely illustrative and are not intended to be in any sense limiting.

- 20 The invention consists of the foregoing and also envisages constructions of which the following gives examples only.

## DRAWING DESCRIPTION

One presently preferred embodiment of the invention will now be described with reference to  
25 the accompanying drawings, wherein;

**Figure 1** is a block diagram of a known set top box

**Figure 2** is a block diagram of a set top box according to the present invention

**Figure 3** is an elevation of a set top box including connected modules according to the invention

**Figure 4** is an elevation of the set top box of Figure 3 containing only a single additional module

**Figure 5** is a rear elevation of Figure 3

**Figure 6** is a schematic layout of module recognition electronics according to the invention

**Figure 7** is a detailed block diagram of the present invention. expanding upon the detail shown in Figure 2

**Figures 8-11** are block diagrams of a power supply module, Dual Tuner Module, Home Theatre Module and Modem Module respectively.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to Figure 1 of the drawings, a general layout for a known set top box is shown. The box is in the block diagram each represent a functional component of the box.

Therefore, a NIM (Network Interface Module) tuner decoder 101 is provided connected to a demultiplexer 102 for demultiplexing the information stream from the tuner and supplying that information to a video decoder 104. Demultiplexed audio information is provided to an audio decoder 105 and from there to an analogue digital converter 106 which provides the analogue output signal to a speaker such as the speaker 107 of a television set. Similarly, the video information is provided in digital format to a digital encoder 110 which provides the digital information in an appropriate format for analogue digital conversion using D-A converter 111 for provision to the video input to a television set for example.

The system is controlled by a CPU 113 which has a RAM 114 and a flash memory 115.



In some STB embodiments a hard disk 117 and DVD drive 118 may also be provided.

The disadvantage with the set top box construction of Figure 1 is that all the features are provided in the one construction. In the example of Figure 1, the features are the satellite tuner and the satellite cable tuner, the DVD and the hard disk drive. Therefore, the set top box of Figure 1 allows a user to receive a cable television transmission, a satellite television transmission, and to use a hard disk or a DVD to view movies. The main problem that arises is that many consumers will not be interested in all the features. Thus for example in some geographic locations there may be no cable broadcast available, so the cable NIM that the user of the box of Figure 1 has paid for is redundant. Therefore, typically manufacturers of these TV have tried to pack in as many features as possible for the "sophisticated" market, or as few features as possible for the highly competitive pay TV markets. Obviously, the disadvantage with a set top box manufactured for the pay TV market is that the box would typically contain one of a tuner decoder or a cable decoder. Therefore, if a pay TV customer was receiving satellite broadcasts, then that customer would purchase a satellite tuner STB for example. Then, if a cable service was subsequently provided, the user would have to purchase a separate STB which includes a cable tuner. Therefore, the consumer will end up with two separate STB's. Similarly, if the consumer decided to use the cable link for an internet connection, then a further set top box having an appropriate data interface would be required.

In the conventional box such as that shown in Figure 1, all the peripherals are included on a single board and the connection to those peripherals is done by conventional connectors such as IDE for disks, serial ports for modems, parallel port for printers etc.

A block diagram for a set top box according to the present invention is illustrated in Figure 2. The construction of Figure 2 has a central processor 201 which includes a processor chip 202, random access memory 203 and flash memory 204. Connections are provided from central processor 201 for connecting peripherals that are provided in the form of modular add on units. Therefore, for example, a cable decoder, satellite decoder and terrestrial decoder are each provided as separate modular add on units referenced 205 to 207 respectively. A DVD/CI modular unit can also be provided referenced 208. A disk 209 can be provided as a modular unit together with a DVD 210. Similarly, ethernet 211 S/C 212, I2C 213, serial port 214, firewire/IEEE1394 215, USB-ADSL 216 can all be provided. The foregoing modules are

illustrated by way of example only. A large number of other peripheral units or interfaces can be provided. The output from the central processor 201 is referenced 220 and comprises a video output and an analogue output which can be used to connect to consumer electronic devices in the home, such as a television set 221.

- 5 This modular approach is shown in the design of Figure 2 allows a pay TV operator to install the lowest functionality STB while also providing the ability to upgrade that STB in the future at a rate that the customer is prepared to pay for. In particular, the modular approach is based upon providing all the connections down a single connector so that additional peripherals can be added by connecting onto the required ports on the inter connection between the modules.
- 10 Therefore, the base module, being the central processor 201 still includes all the requirements for a basic STB. The single peripheral that is generally specific to a market is the type of tuner used. Generally, the output of the tuner is a transport stream and the transport stream for different tuners is identical, therefore this functional block has been separated in the present invention to allow modular units that cater to all operator requirements.
- 15 Referring to figure 3 an embodiment of a set top box according to the invention is shown. A "stack" of modular components can be formed to provide a STB having the functionality desired by a user. Thus a base unit 301 is a fundamental component in this embodiment. The base 301 comprises the central processor 201 referred to in figure 2. At the other end of the STB a power module 302 is provided. It will be appreciated that the power module could be part
- 20 of the base unit if desired. Removeably connected between the base 301 and the power module 302 are a satellite decoder module 303, a terrestrial decoder module 304, wireless module 305, print interface module 306, ADSL modem interface module 307, USB hub interface module 308, PVR hard disk interface module 309, analogue interface module 310, DVD module 311 and home theatre module 312. At least one, but preferably two conditional access (CA)
- 25 modules are provided as part of the central processor 301 to control access for the viewing of pay television programs and the like. The CA module(s) may alternatively, or in addition, be provided as further modules.

Each module can be selectively removed from/replaced in the stack. The base 301 and power 302 modules are essential for operation in this embodiment and must always be present. In

30 practice, a communications signal receiving/transmitting module will usually be present also to

allow the unit to function as a set top box ie to at least allow the unit to receive and interpret broadcast digital information. Thus in figure 4 the STB is shown with the base and power modules and the satellite decoder module 303. In this embodiment the flexibility provided by the invention is apparent. The user can purchase the base and power modules and, if the unit is to be used for satellite broadcast reception, the user need only purchase the satellite module and not other modules. As the user decides to increase/alter the features of the STB, the user can purchase, replace, or discard modules to arrive at a unit that offers all the functionality that the user desires or can afford. Therefore, a STB is formed as a single assembly of releasably interconnected modules.

Turning now to figure 5, the embodiment of figure 3 is shown in rear elevation. The rear of each module has appropriate output electrical connectors, generally referenced 500, to allow the appropriate connections to be made to each module. Thus, for example, the base unit will have one or more outputs for audio and visual signals for connection to a television set, or monitor and stereo amplifier. The timer modules each have an input for RF signals from an antenna or cable termination.

It will be appreciated that the base unit does not have to have an audiovisual output. Audio and/or visual signals can be supplied to the user via one or more of the module interfaces.

To enable the modules to communicate an interconnect is provided. As will be seen, the interconnect is not a bus such as PCI carrying address, data and control lines. The interconnect is a collection of distinct communications networks at the physical layer. These connections run from each module to the next. Within the module the connection may be "Tee'd" (for example in the case of IIC and similar signals), terminated, repeated, or run straight through the module. The physical connection for the interconnect is made by a connector in the side of the housing or chassis of each module. In the preferred embodiment the modules and/or connectors are designed so as to allow the connectors to be connected together in only the correct orientation. Furthermore, in the preferred embodiment the metallic connection elements of the connectors are physically protected in the unconnected state by a cover which is designed to expose the elements when the connectors of adjacent modules are pressed together in the correct orientation to form the physical connection between adjacent modules. The connector physical design in the preferred embodiment extends to having the physical power connection being the

first to disconnect (for example by being made shorter than the other connection elements) upon the modules being pulled apart to ensure that the modules are not damaged. This construction has the advantage that neither the central processor does not require all the connectors for a fully expanded STB, so there is a cost saving in connection hardware.

- 5 Therefore the invention provides module connections that are easily performed by the user since they are simple and straightforward and foolproof. No specialised knowledge is required.

Where a function utilises a connection exclusively the connection is terminated at that module. With some modules the signal needs to be repeated. For example in the USB bus every other module connecting to the USB bus is required to have at least a two port USB hub internally  
10 with the upstream port connected to the input and one of the ports connected to the output port.

Each module includes an identity controller. This controller is programmed with data relating to the functions that the module can perform, and the ability to identify the base unit to provide an authentication function.

The central processor 301 integrates each module at power-up to determine which module(s) are  
15 connected to form the STB, so that the overall configuration is always known without any expertise being required by the user.

Verifying that an installed module is genuine is a desirable feature offered by the invention. This feature is particularly useful when connecting modules that may in turn connect to other supplier's networks. In these instances, most suppliers want to be assured that inferior quality  
20 modules will not cause a fault that will impact on their network. Verification of modules means that the invention can ensure that only approved modules can be allowed to operate in the STB.

The preferred module verification procedure is based on a "Zero Knowledge Proof" algorithm that will allow the main processing module to verify the authenticity of any module connected to the system. This algorithm allows the installation of approved devices onto the STB and  
25 these approved devices can be determined by the main supplier or operator.

Therefore, unauthorised duplication of modules will be very difficult with different approval keys being issued to each approved manufacturer. This in turn allows each operator to select

which manufacturer's modules can be connected to the system. The approved manufacturer's list can be updated dynamically within the STB online without user knowledge or intervention.

The identity controller is also capable of assisting service discovery. It also knows the version of software required to be installed.

- 5 As a further illustration Figure 6 shows a schematic of an interconnect arrangement according to one embodiment of the invention. The arrangement includes registration electronics which connect to a control bus that is distributed to all modules. Some of the module electronics connect to signals that extend to other modules. Some signals are terminated by one module and will not proceed to other modules, i.e. the function provided by that module means that  
10 other modules are not required to provide that function.

In use, the assembly is first connected to a television, communications port and a power source. The central processor will then automatically register all the connected modules. A registration controller in each module signals to the central processor its type, version and serial number. The central controller then determines what firmware and/or software is required and loads it  
15 off each module or downloads the latest firmware or software for a particular application via the internet for example. According to one embodiment, the user can be asked configuration questions via the TV interface either by voice or questions displayed by the assembly.

The list below show physical examples of typical hardware components of assembly modules:

- Audio Visual Processing Module
- 20 • Power Supply Module
- Satellite Dual Tuner Module
- Terrestrial Dual Tuner Module
- Media Bay Module
- Disk Player Plug-In
- 25 • Media Recorder Plug-In

- V.90 Modem Module
- Home Theatre Module
- ADSL Model Module
- Cable Dual Tuner Module
- 5 • USB Hub Module
- Power Line Model Module
- Analog TV/FM Tuner Module
- Local RF Module
- RF Remote Control
- 10 • DOCSIS Modem Module
- Home PNA Module
- Gaming Console Module
- IP Telephony Module
- Wireless LAN Module
- 15 • Swipe Card Pin Pad Module

Turning to figure 7, a block diagram 601 of the base unit 301 (figure 3) or central controller 201 (figure 2) is shown. The heart of the module is a processor 602. In the preferred embodiment this is an IBM Pallas Processor, which is a highly integrated processor designed specifically for STB devices. A gate array 603 is also provided together with SDRAM 604, and Flash Memory 605. As shown, the preferred embodiment of the base unit also includes front panel controls 606, infrared remote receiver 607, and two smart card readers 608 and associated circuitry for use within the CA subsystem. The gate array 603 includes functions for:

Demultiplexing MUX pins on the processor; decoding GPIO pins on the processor; DVB-CI transport stream routing; Digital video port demultiplexing; 10/100 Ethernet MAC; Home PNA MAC; RF transceiver interface; General glue logic.

By way of example, block diagrams for a power supply module, dual shared module, home theatre module, and modem module are shown in Figure 8 to 11 respectively.

Referring to Figure 8, the power supply is shown being referenced 801, supplying required voltages to the connection so as to provide an effective power supply to the system. An identity and local controller (as discussed above) is provided for module identification, configuration and control purposes.

Turning to Figure 9, a dual tuner module is shown having a dual tuning block which provides transport streams to a transport stream access controller 902 for provision of the appropriate signals to the connector. The identity and local controller is referenced 903.

In Figure 10, home theatre module is shown having a high voltage power supply 1001, an identity and local controller 1002 and a gate array 1003. The gate array receives digital audio data from the connection and supplies these to the output stages 1004 which in turn supply appropriate signals to speaker connector 1005.

In Figure 11 V.90 modem module is shown. The identity and local controller is referenced 1101. A uart 1102 provides signals to and from the module connector and in turn communicates with a single chip modem 1103 which in turn communicates with a digital ISO barrier 1104. A smart DAA 1105 is provided between a digital ISO barrier and a telephone line interface discreet components 1106.

It will be seen that the present invention provides a transceiver device such as a set top box which has significant advantages over the prior art. In particular, the box is capable of being supplied with minimal functionality required by a user, but is also capable of being expanded to a very high degree of functionality, dependent upon the requirements of the user.

## WE CLAIM:

1. A set top box assembly having  
  
an input for receiving input signals from one or more remote service providers,  
  
a central processor for controlling distribution to a consumer of signals received from  
5 the remote service provider,  
  
an output for distributing audiovisual signals processed by the central processor  
  
the set top box characterised in that it includes at least one module which is adapted to  
recognise at least one signal received by the central processor or transfer a further signal  
to an adjacent module, such that the consumer may receive a visual or audio signal  
10 according to the recognition of that signal by a particular module.
2. An assembly as claimed in claim 1 wherein the output is provided on the central  
processor .
3. An assembly as claimed in claim 1 wherein the central processor is provided in a  
housing having a connector at one side thereof, and each module is in a housing having a  
15 complimentary connector on a side thereof, the connectors being adapted to engage with  
each other to provide an electrical connection between the central processor and the  
module so that the module and the central processor are located adjacent to each other.
4. An assembly as claimed in claim 3 wherein a further module is provided having a  
further connector on a side of the further module, the further module being capable of  
20 being connected to the module to create an electrical connection therebetween so that the  
modules are located adjacent to each other and whereby the central processor may  
communicate with the further module.
5. An assembly as claimed in claim 3 wherein the central processor housing and the  
module housing or the connectors provide a physical connection.
- 25 6. An assembly as claimed in claim 1 wherein the module(s) and the central processor can  
be selectively replaced individually or in combination.



7. An assembly enabling the provision through subscriber networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer has a choice of the audiovisual services from one or more remote service providers, wherein the assembly comprises
- 5 a set top box having an input for receiving signals from remote locations,
- a central processor for control of distribution to the consumer of the signals received from the remote service provider,
- an output from the set top box for distributing audiovisual signals processed by the central processor,
- 10 an interface connecting at least one other discreet module to the central processor wherein in each module is capable of receiving and distributing at least one signal delivered to or from the central processor, and
- wherein the interface allows access to the central processor for processing signals from the module and each module is capable of recognising a signal intended for that module
- 15 and distributing through the module signals recognisable by another module and intended for at least one of the other modules.
8. A set top box having an input for receiving input signals from one or more remote service providers, a central processor for controlling distribution to a consumer of signals received from the remote service providers,
- 20 an output on the set top box for distributing audiovisual signals processed by the central processor,
- the set top box including at least one module which is adapted to receive or transmit signals containing audio and/or visual information to or from the central processor,
- the set top box including authentication means whereby valid authentication provides a
- 25 first degree of connectivity between the central processor and the module, and

invalid authentication provides a second degree of connectivity between the central processor and the module.

9. A set top box as claimed in claim 8 wherein the first degree of connectivity comprises full communication between the central processor and the module and the second degree of communication comprises substantially no connectivity between the central processor and the module.
10. A set top box as claimed in claim 8 wherein the second degree of connectivity comprises limited communication between the central processor and the module or limited module functionality.
11. A system enabling the provision through one or more subscriber networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer has a choice of the audiovisual services from one or more remote service providers, the system including
- a set top box having input for receiving input signals from the one or more remote service providers,
- a central processor for controlling distribution to the consumer of the signals received from the one or more remote service providers,
- the set top box having an output for distributing audio visual signals processed by a central processor.
- the set top box including at least one module which is adapted to receive signals from or transmit signals to the central processor.
- the system including software management means whereby information required for operability of the module or the central processor is provided to the module or the central processor while the system is operating.
12. A method for enabling the provision through subscribing networks of a variety of audiovisual signals from remote locations to a consumer station such that the consumer

has a choice of audiovisual services from one or more remote service providers, the method comprising the steps of

- 5 (c) providing a set top box having an input for receiving signals from the one or more remote locations, a central processor for the control and distribution of signals received from the remote service providers to the consumer,
- (d) providing on the set top box an output for distributing audiovisual signals processed by the controller,
- 10 (e) providing an interface connecting at least one other discreet module to the central processor, each module being capable of receiving or distributing at least one signal delivered from the controller.

13. A method as claimed in claim 12 wherein the method includes the step of allowing module access to the central controller for processing of the module signals.

14. A method as claimed in claim 12 including the step of allowing each module to recognise a signal intended for that module and distributing through one module a signal  
15 recognisable by another module.

15. Any novel feature or combination of each is disclosed herein.

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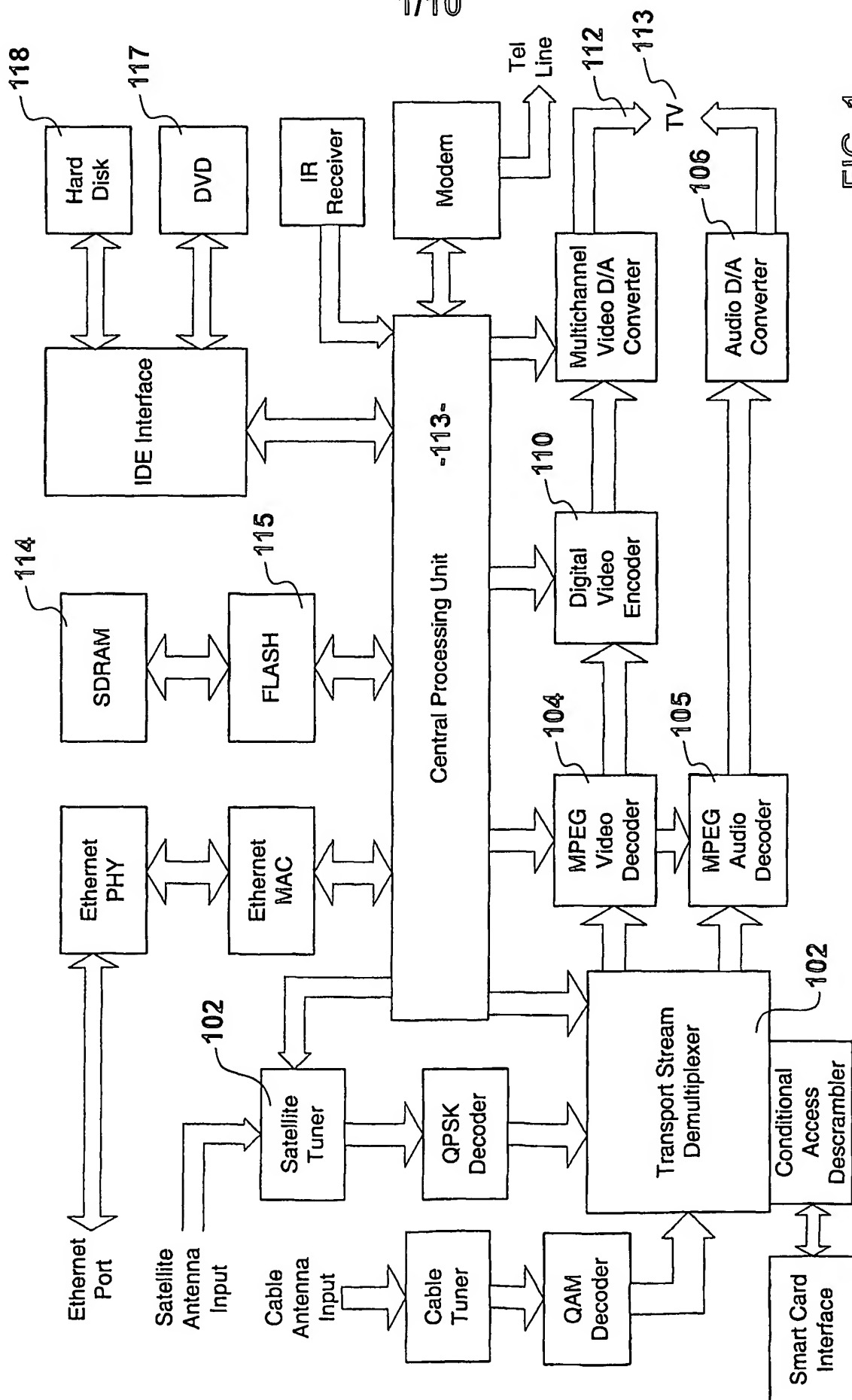
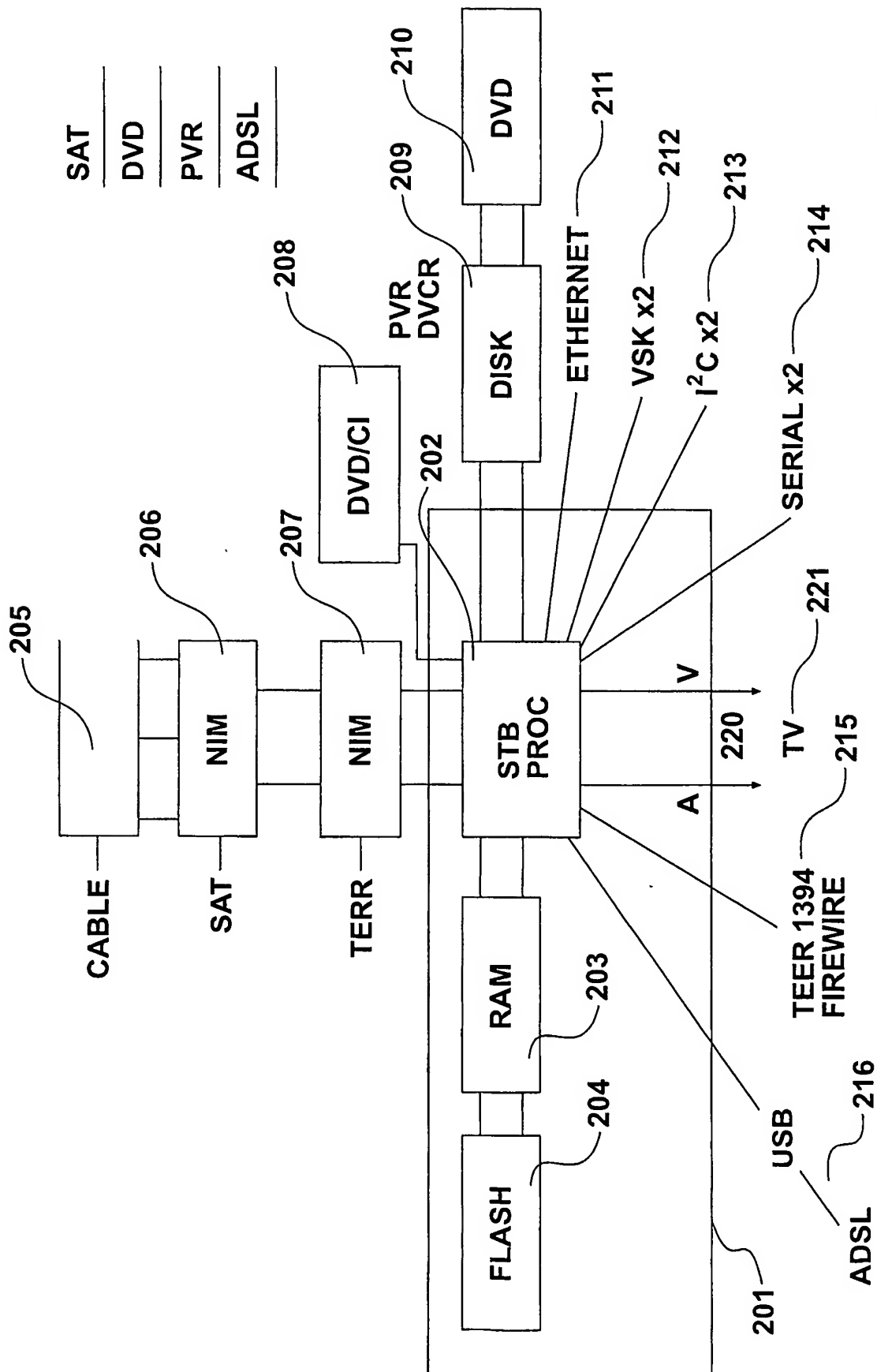
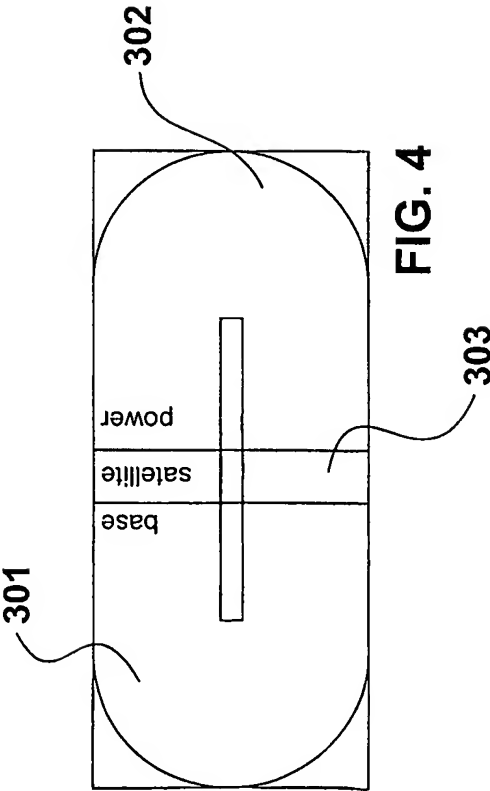
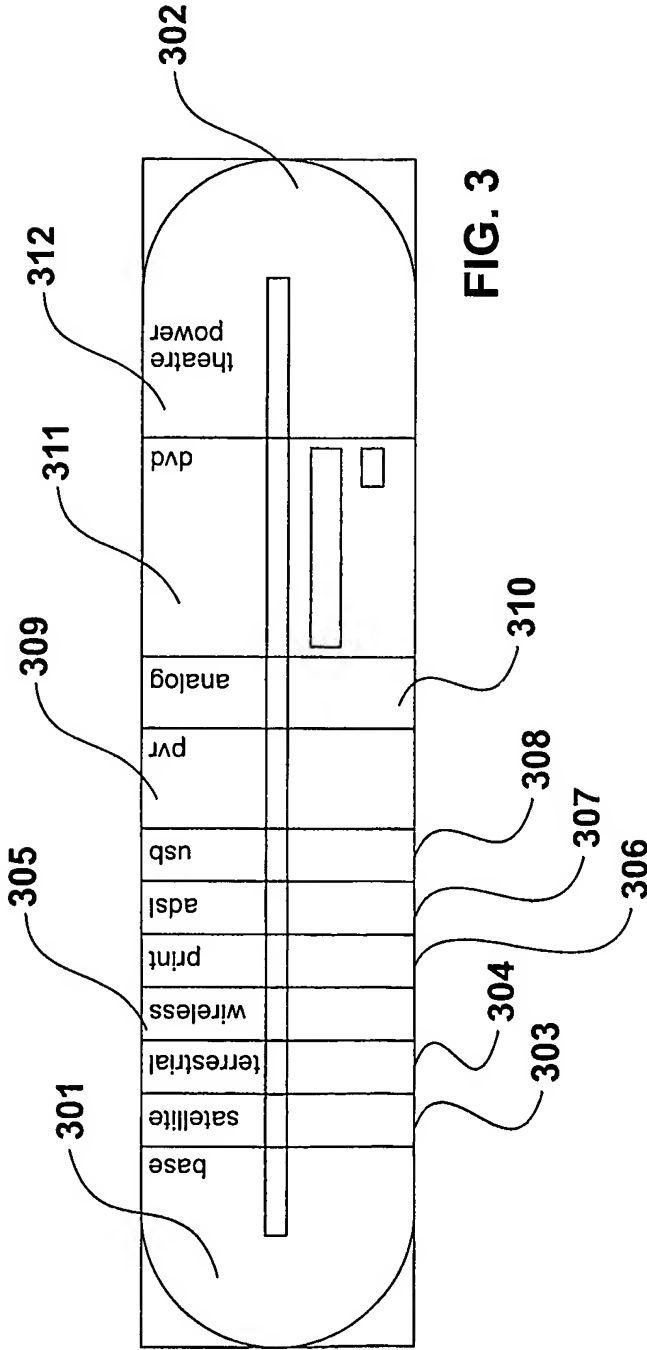


FIG. 1



**FIG. 2**



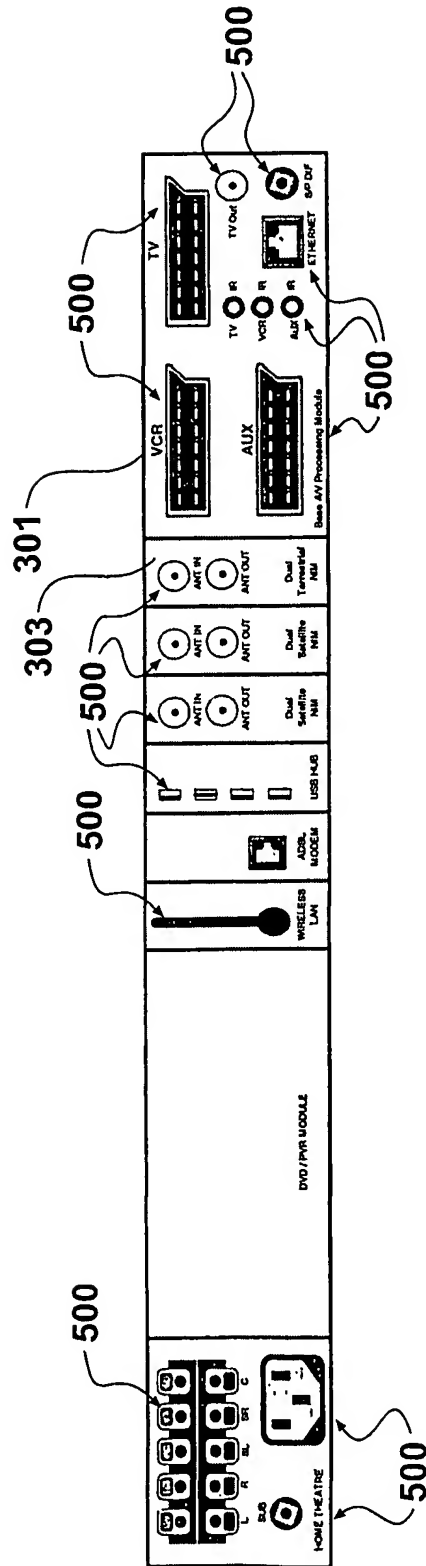
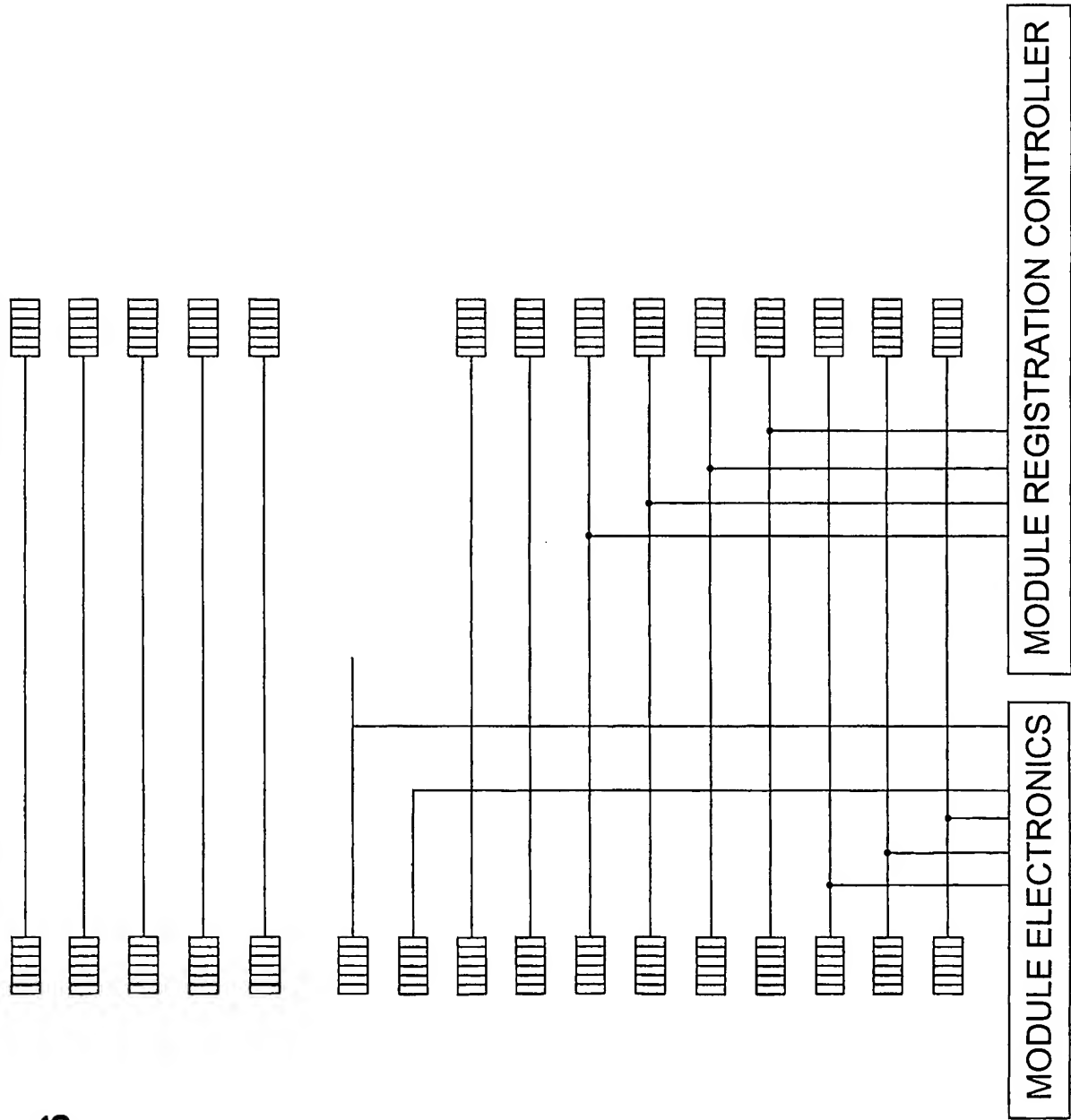


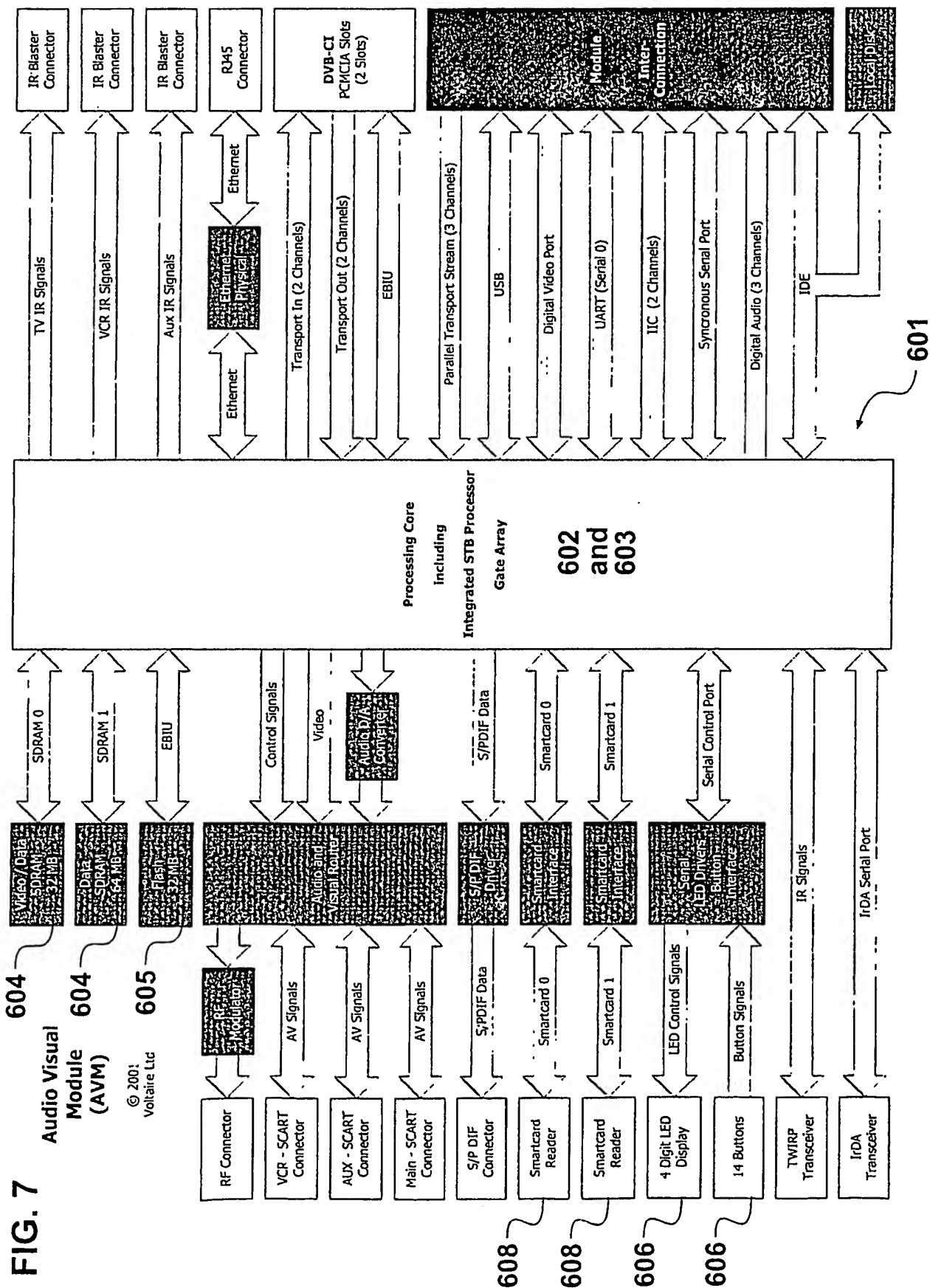
FIG. 5

INTERCONNECT INPUT                      INTERCONNECT OUTPUT

FIG. 6







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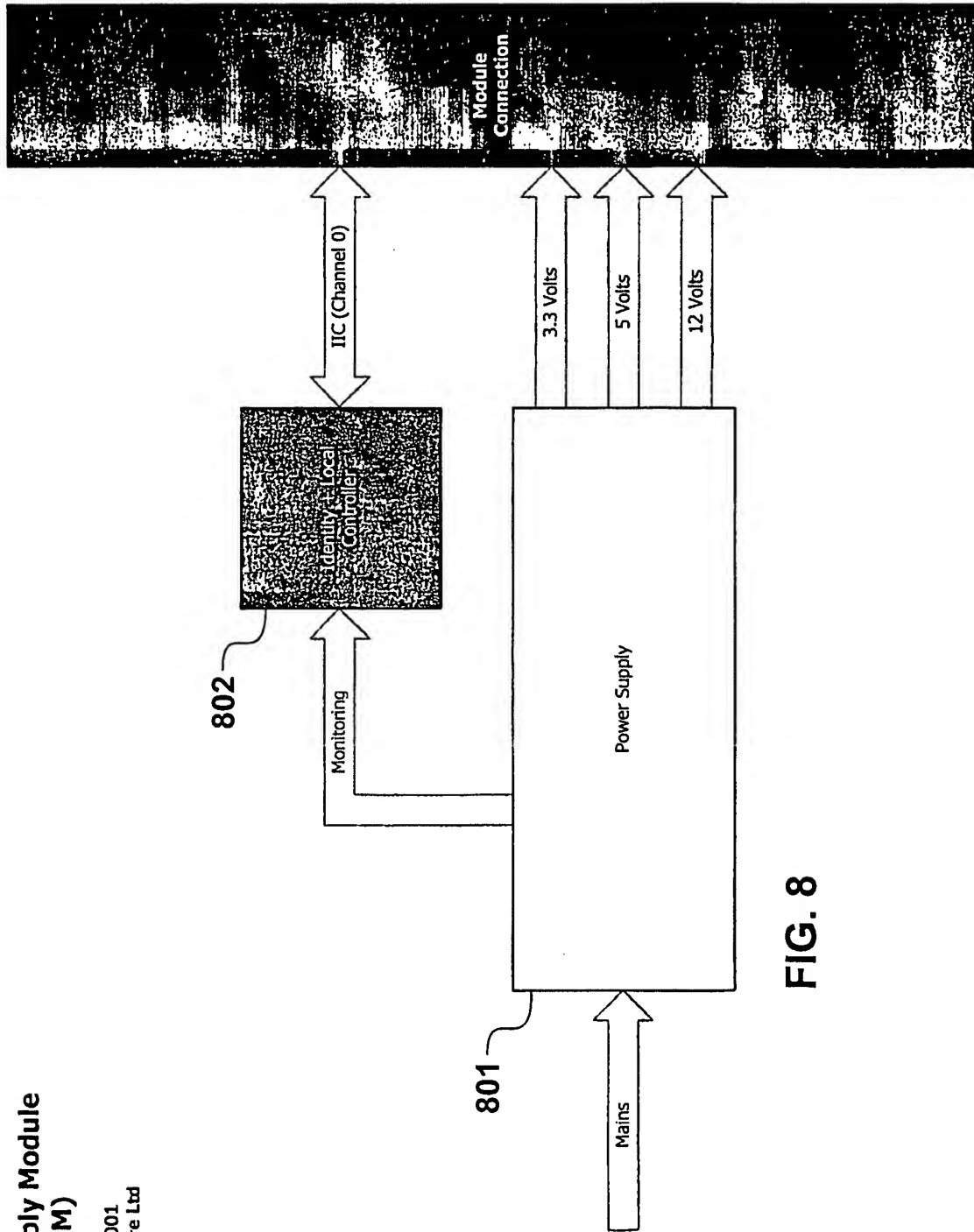


FIG. 8

Power Supply Module  
(PSM)

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# Dual Tuner Module

Satellite - (STM)  
Terrestrial - (TTM)  
Cable - (CTM)

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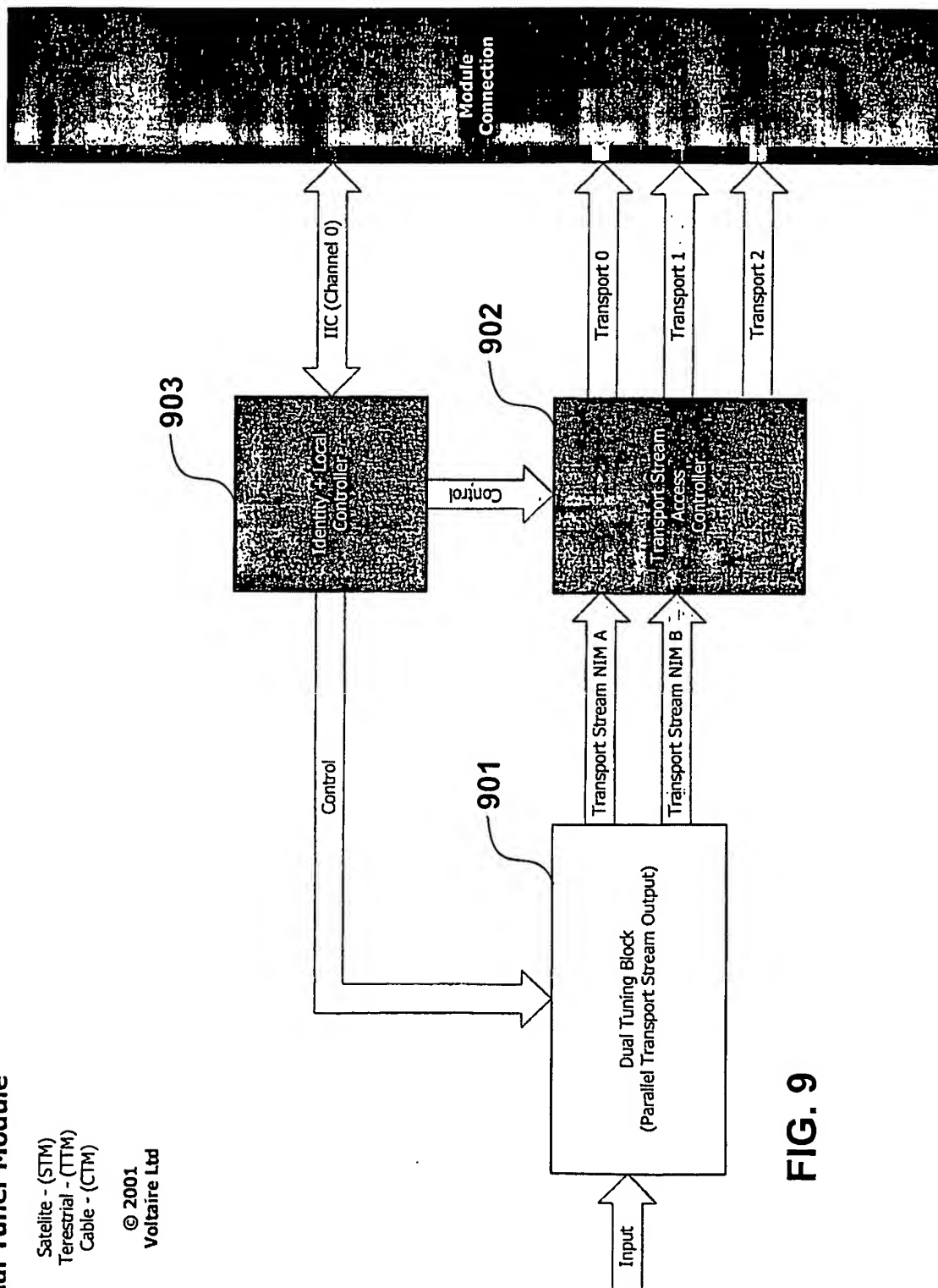


FIG. 9

# Home Theatre Module (HTM)

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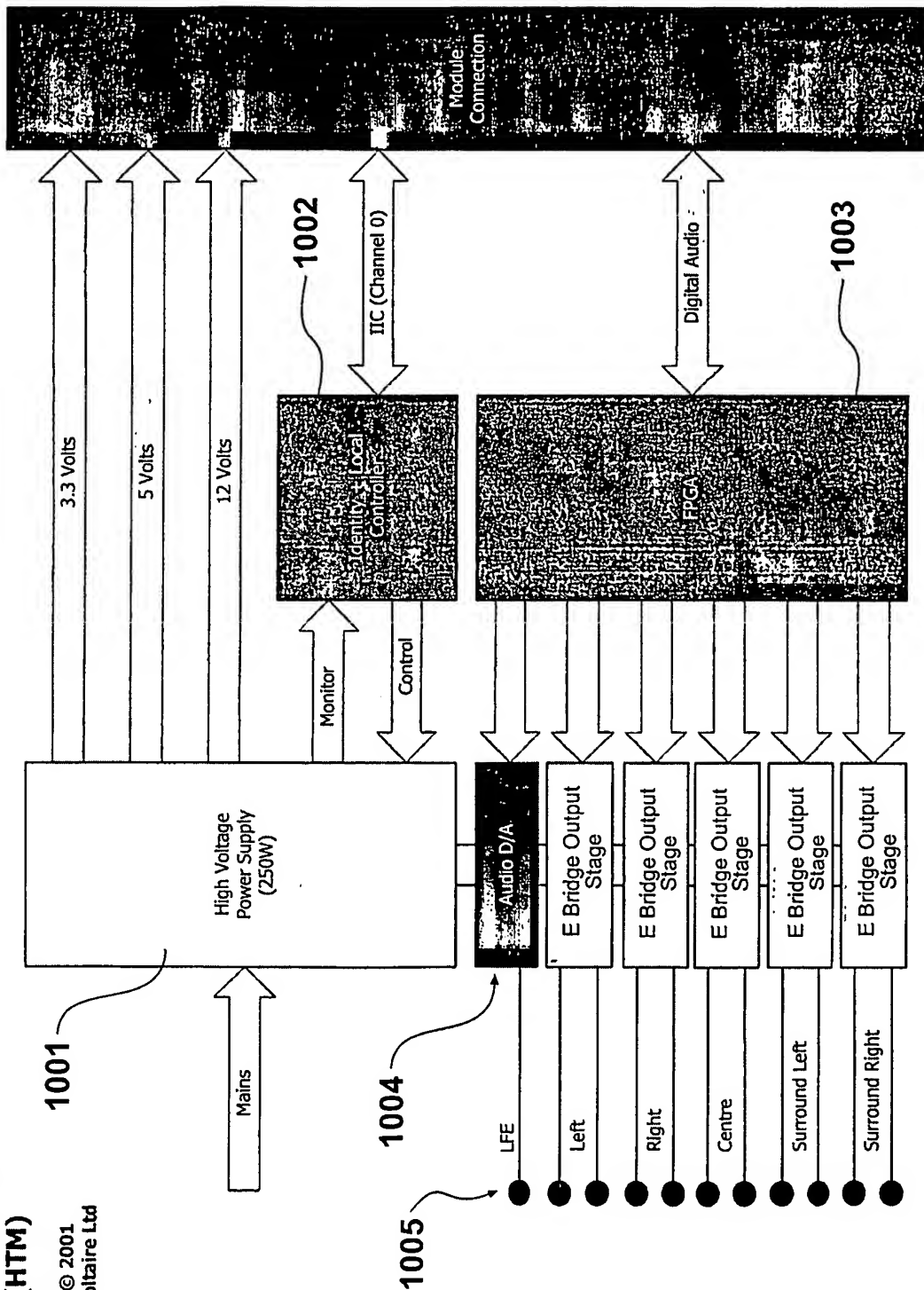


FIG. 10

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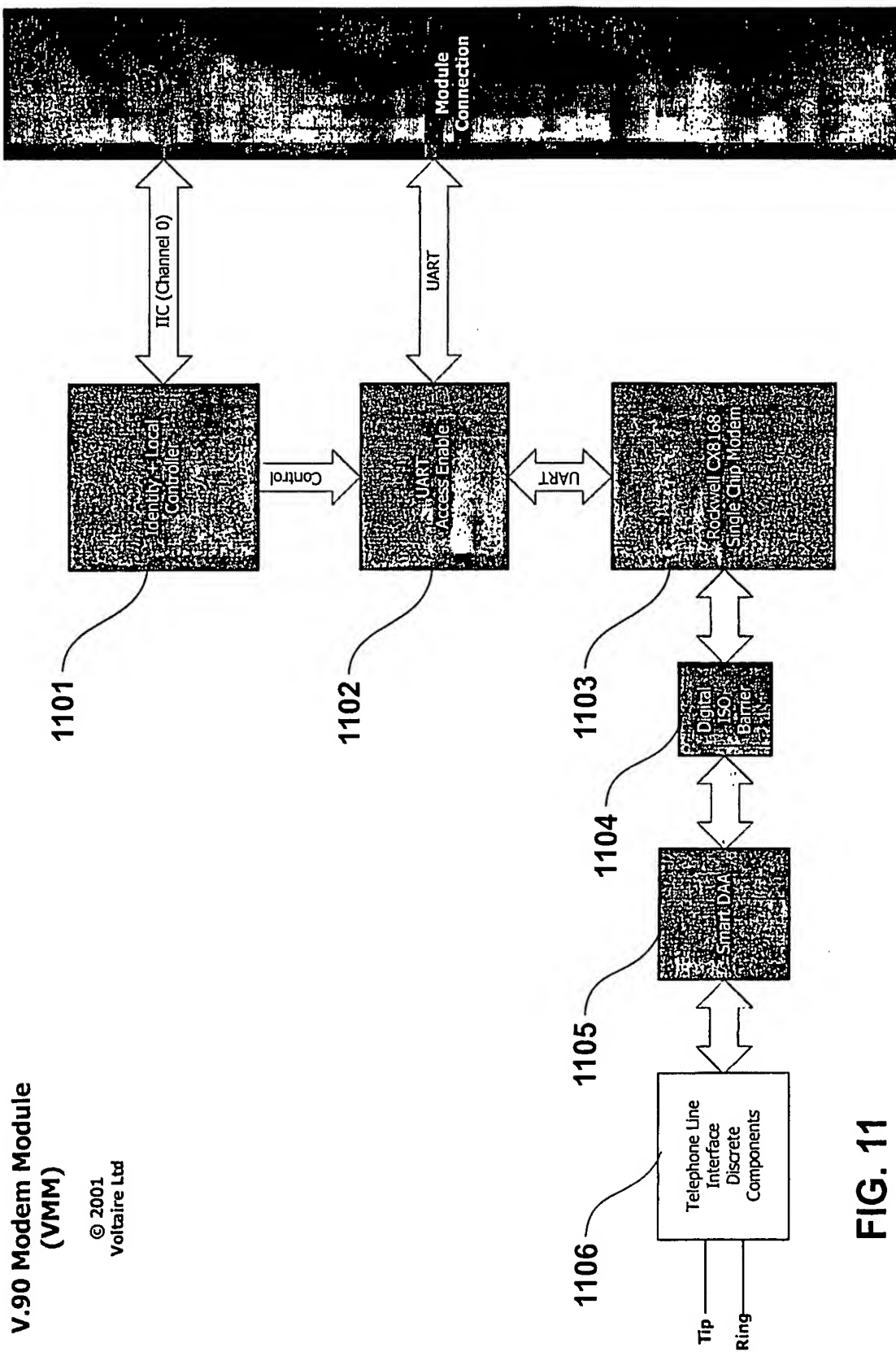


FIG. 11

V.90 Modem Module  
(VMM)

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Voltaire Ltd

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00240

**A. CLASSIFICATION OF SUBJECT MATTER**Int. Cl. <sup>7</sup>: H04N 7/16

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPAT: set top box, transceiver, decoder, processor, controller, audiovisual, signal, television, broadcast, assembly, unit, module

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2330722 A (GENERAL INSTRUMENT CORPORATION) 28 April 1999 abstract, Figs 1-4, page 5, lines 2-18, page 6, line 16 - page 11, line 19	1-8, 11-14
X	US 5619250 A (McCLELLAN ET AL) 8 April 1997 abstract, Fig 2, column 3, line 64 - column 4, line 60	1-8, 11-14

☒ Further documents are listed in the continuation of Box C
☒ See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

10 January 2002

Date of mailing of the international search report

17 JAN 2002

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00240

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6061719 A (BENDINELLI ET AL) 9 May 2000 Fig 3, column 1, line 45 - column 2, line 29	1, 7, 11-14
A	US 6009116 A (BEDNAREK ET AL) 28 December 1999 abstract, Fig 5, column 3, line 20 - column 6, line 55	1, 7, 11-14
A	US 5649283 A (GALLER ET AL) 15 July 1997 abstract, Fig 2	1, 7, 12

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00240

**Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos : 15  
because they relate to subject matter not required to be searched by this Authority, namely:  
Claim 15 is of indeterminate scope such that no meaningful search can be carried out.
2. ☐ Claims Nos :  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.



INTERNATIONAL SEARCH REPORT  
Information on patent family members

International application No.  
**PCT/NZ01/00240**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
GB	2330722	CA	2250653
		FR	2770727
		US	6271837
		CN	1225543
		JP	11275481
		DE	19848899
		US	5982363
US	5619250	NONE	
US	6061719	EP	915621
US	6009116	BR	9608217
		CA	2220035
		EP	883964
		US	5621793
		WO	9635293
		US	6108365
		AU	69673/98
		EP	985276
		WO	9847237
		EP	1072104
		BR	9607719
		AU	30015/99
		CA	2212730
		WO	9953624
		AU	49879/96
		EP	808287
		CN	1179137
		NZ	303534
		EP	808287
		US	5649645
		WO	9626012
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